

REMARKS

By this amendment, claims 1-9, 11 and 18-19 are pending in the application. Of these, claim 9 is being amended and claims 18-19 are being added. Claim 10 is being canceled and claims 12-17 are being withdrawn. The amendments are fully supported by the originally filed specification and original claims and do not add any new matter. Accordingly, entry of the amendments and reconsideration of the present case is respectfully requested.

Restriction Requirement

The Examiner has required restriction between the following groups of claims:

- I. Claims 1-11, drawn to a substrate processing chamber component, as defined by the Examiner; and
- II. Claims 12-17, drawn to a method of making a component, as defined by the Examiner.

Applicants affirm the election made by telephone on July 21, 2004 of the claims of group I, namely claims 1-11. Claims 12-17 are withdrawn as being to a non-elected invention. However, Applicants reserve the right to present claims 12-17 in a future divisional filing of the current case.

Double Patenting Rejection of Claims 1-11

The Examiner rejected claims 1-11 under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-35 of U.S. Patent No. 6,777,045. The Examiner furthermore stated that "a timely filed disclaimer in compliance with 37 C.F.R. 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting

application or patent is shown to be commonly owned with this application."

U.S. Patent No. 6,777,045 and the present application are commonly owned. A terminal disclaimer will be filed once the substantive rejections have been addressed. Accordingly, the double patenting rejection of claims 1-11 is obviated.

Objection to Specification

The Examiner objected to the Specification because "the abstract contains legal phraseology such as 'comprises.'" The abstract is being amended to replace the term "comprises" with "has," and thus the Specification should no longer be objected to.

Rejection Under 35 U.S.C. 102(e) of Claims 9 and 11

The Examiner rejected claims 9 and 11 under 35 U.S.C. 102(e) as being anticipated by U.S Patent Application Publication No. 2002/0086118 to Chang et al. This rejection is traversed.

Claim 9 is patentable over Chang et al. because Chang et al. does not teach "a structure composed of aluminum oxide, the structure having a roughened surface with a roughness average of from about 150 to about 450 microinches," as recited in the claim. Chang et al. discloses that "surface preparation techniques such as cleaning and grit or bead blasting can be used to provide a more chemically and physically active component surface for bonding of the plasma sprayed coating" (paragraph 26, first sentence.) However, Chang et al. does not teach an actual roughness average value that is suitable for an aluminum oxide structure. Chang et al. also does not teach "a plasma sprayed ceramic coating deposited on the surface of the structure, the plasma sprayed ceramic coating being composed of aluminum oxide and having a porosity of from about 5% to about 10%," (underline added) as recited in the claim. Accordingly, as Chang et al. does not teach each and very element in the claim, claim 9 and the claims depending therefrom are not anticipated by Chang et al.

Rejection Under 35 U.S.C. 103(a) of Claims 1-11

The Examiner rejected claims 1-2, 4-8 and 10 under 35 U.S.C. 103(a) as being unpatentable over Chang et al. This rejection is traversed.

Claim 1 is patentable over Chang et al. because Chang et al. does not teach or suggest "a structure composed of aluminum oxide and having a roughened surface with a roughness average of from about 150 to about 450 microinches [and] ... a plasma sprayed ceramic coating deposited on the roughened surface of the structure, the plasma sprayed ceramic coating composed of aluminum oxide," as recited in the claim. As discussed for claim 9 above, Chang et al. does not teach or suggest a value for the roughness average that is suitable for a structure having a plasma-sprayed ceramic coating deposited thereon, and thus does not teach the recited value of from about 150 microinches to about 450 microinches. Instead, Chang et al. discloses that "bead blasting can be used to provide a more chemically and physically active component surface for bonding of the plasma sprayed coating," (paragraph 26, first sentence), but does not teach or suggest the surface roughness average value recited in the claim.

Furthermore, the Examiner asserts that "Chang et al. further teach that the final outside roughness of the coating is between 150 and 450 microinches. One of ordinary skill in the art would have recognized that the roughened surface of the structure would be roughened in an amount to maximize the bonding of the coating to the structure, as taught by Chang et al, and that the roughness value must be close to the range of 150 to 450 microinches because the textured surface of the ceramic coating has a roughness value between 150 to 190 microinches." However, in the section to which the Examiner refers, Chang et al. discloses that "the inventive coatings preferably have surface roughness values (Ra) suitable for achieving improved adhesion of polymer byproducts produced during processing of substrates in the plasma reactor ... [such as] 150 to 190 micro-inches" (underline added, paragraph 22,

third through fourth sentences.) Thus, Chang et al. discloses that the coatings have a surface roughness that improves polymer adhesion, but does not teach or suggest any benefits in the adhesion of a ceramic coating, such as the recited aluminum oxide coating, for a surface having an average surface roughness value in the recited range.

Furthermore, while Chang et al. disclose that it may be desirable to grit blast a surface before plasma spraying a coating onto the surface, this does not constitute a teaching towards grit blasting the a structure to a roughness that is similar to a desired overlying coating surface roughness. Instead, as is known to those of ordinary skill in the art and described in the present Specification, the surface roughness average of plasma sprayed coatings is dependent on numerous other factors that influence the final coating surface properties, such as for example the thickness and porosity of the final coating, as well as plasma spraying parameters such as the average temperature and energy of the molten coating particles upon impacting an underlying structure, the density and flow rate of the sprayed molten particles, the pressure of the carrier gas, and the angle of particle impact and the stand-off distance, among other factors. For example, as described in the Specification in paragraph 47, "the standoff distance and angle of deposition can be adjusted to modify the pattern in which the molten coating material 425 splatters upon impacting the surface 436, to form for example, "pancake" and "lamella" patterns. The standoff distance and angle of deposition can also be adjusted to modify the phase, velocity, or droplet size of the coating material 425 when it impacts the surface 436." Thus, parameters other than the roughness of the underlying structure, such as the spraying standoff distance and angle of deposition, can be modified to induce substantial changes in the topography of the final coating surface.

Applicants have indeed discovered that providing a surface roughness average of an underlying structure of from about 150 to about 450 is beneficial for coated structures. These benefits are believed to include improved adhesion of coatings to the structure, and the imparting of at least a portion of the underlying surface texture to the final coating texture. However, the Examiner would have had to use

hindsight knowledge gained from the Applicant's own application in order to infer this teaching from Chang et al. because Chang et al. does not teach or suggest any benefits obtained from an underlying structure having a surface roughness within the claimed range. Instead, Chang et al. discloses that grit blasting can be conducted to "provide a more chemically and physically active component surface for bonding of the plasma sprayed coating," (paragraph 26, first sentence) but Chang et al. does not teach or suggest the claimed range of surface roughness values that provides improved coating adhesion and coating surface characteristics. Accordingly, as Chang et al. does not teach or suggest a roughened surface having the recited range, claim 1 and the claims depending therefrom are patentable over Chang et al.

Claim 9, from which claim 10 depends, is patentable over Chang et al. because Chang et al. does not teach or suggest "a structure composed of aluminum oxide, the structure having a roughened surface with a roughness average of from about 150 to about 450 microinches [and] ... a plasma sprayed ceramic coating deposited on the surface of the structure, the plasma sprayed ceramic coating being composed of aluminum oxide and having a porosity of from about 5% to about 10%," as recited in the claim. Instead, as disclosed above, Chang et al. does not teach or suggest providing the recited average surface roughness value of the roughened surface of the structure. Chang et al. also does not teach or suggest the recited porosity of from about 5% to about 10%. Accordingly, claim 9 and the claims depending therefrom are patentable over Chang et al.

The Examiner rejected claim 3 under 35 U.S.C. 103(a) as being unpatentable over Chang et al. in view of U.S. Patent No. 4,419,201 to Levinstein et al. This rejection is traversed.

Claim 1, from which claim 3 depends, is patentable over Chang et al. and Levinstein et al. because the references do not teach or suggest "a structure composed of aluminum oxide and having a roughened surface with a roughness average of from about 150 to about 450 microinches [and] ... a plasma sprayed ceramic coating

deposited on the roughened surface of the structure, the plasma sprayed ceramic coating composed of aluminum oxide," as recited in the claim. Instead, as discussed above, Chang et al. does not teach or suggest a structure composed of aluminum oxide and having a roughened surface with a roughness average of from about 150 to about 450 microinches. Levinstein et al. does not make up for the deficiencies of Chang et al. Levinstein discloses that "aluminum oxide coatings can be applied to surfaces made, for example, of aluminum, magnesium, titanium, stainless steel, ceramic, plastic or glass," (column 4, lines 43-45) but does not teach or suggest the recited average surface roughness of the roughened surface. Accordingly, claim 1 and the claims depending therefrom are patentable over Chang et al. in view of Levinstein et al.

The Examiner rejected claims 1-2 and 4-11 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,120,640 to Shih et al. in view of U.S. Patent No. 6,152,071 to Akiyama et al. This rejection is traversed.

Claim 1 is patentable over Shih et al. in view of Akiyama et al. because the references do not teach or suggest "a structure composed of aluminum oxide and having a roughened surface with a roughness average of from about 150 to about 450 microinches [and] ... a plasma sprayed ceramic coating deposited on the roughened surface of the structure, the plasma sprayed ceramic coating composed of aluminum oxide," as recited in the claim. Shih et al. discloses that "prior to anodization, the chamber wall 14 is roughened within a band 62 surrounding the intended end of the exposed band 56" (column 8, lines 54-56) and that "roughened band extends across the intended transition between the anodized layer and the exposed band 56 where the boron carbide will be sprayed onto the bare aluminum" (column 8, lines 56-59) where "roughening is performed by grit blasting and produces a surface finish Ra [of] about 100 to 150 microinches" (column 8, lines 65-66.) Thus, Shih et al. discloses roughening bare aluminum before applying a boron carbide coating. Shih et al. does not teach or suggest the desirability of providing the average surface roughness on a structure composed of aluminum oxide and providing a plasma sprayed ceramic coating composed of aluminum oxide on the coating.

Shih et al. furthermore does not teach or suggest that an average surface roughness suitable for improving adhesion of a coating to a metal, such as aluminum, would be suitable or provide any benefits in improving adhesion of a coating to a structure composed of aluminum oxide. As metals and ceramics such as aluminum oxide have different properties that affect the adhesion of coating, such as for example different thermal expansion coefficients and different grain and grain boundary region structures, one of ordinary skill in the art would not find it obvious to provide the surface roughness suitable for the metal structure of Shih et al. on a non-metal structure that is composed of aluminum oxide, as in the claim.

In yet another embodiment, Shih et al. discloses that "none of the anodization is removed, but all the portions of the chamber wall which are to be B₄C sprayed are roughened prior to anodization. The resultant thermally sprayed B₄C coating has been observed to adequately adhere to the anodization." (column 9, lines 29-33.) Thus, in this embodiment Shih et al. discloses forming an anodized layer over the roughened aluminum surface, and then forming a B₄C layer over the anodized layer. However, with regards to the boron carbide layer over the anodized layer, Shih et al. does not disclose the average surface roughness value of the anodized layer having the boron carbide layer formed thereover, and thus does not teach or suggest providing the claimed average surface roughness value on an aluminum oxide structure. As noted above, while an underlying surface roughness can effect the surface roughness of the overlying coating, the final surface roughness is also dependent on other factors such as the thickness of the coating, and thus is not completely determined by the surface roughness average of the underlying surface. Thus, the surface roughness average of the anodized layer can not be inferred to be equivalent to the roughness average of the underlying bare aluminum. Furthermore, as boron carbide and aluminum oxide are chemically distinct from one another, coatings fabricated from these materials would not be expected to have identical adhesion characteristics, and instead would be expected to have, for example, different affinities for the underlying material. Thus, even if Shih et al. did disclose an average surface roughness of the anodized layer, one of ordinary

skill in the art would not find it obvious to provide a surface roughness suitable for a structure underlying a boron carbide coating to a structure underlying an aluminum oxide coating.

Furthermore, while Shih et al. discloses a surface roughness average for bare aluminum having an anodized coating, Shih et al. does not teach or suggest a surface roughness that would be suitable in the case of a plasma sprayed coating that is deposited onto a structure, and which typically has different adhesion properties than an anodized coating that is formed out of the structure itself by the process of anodization. Furthermore, as discussed above, while Shih et al. discloses a surface roughness suitable for a coated metal structure (bare aluminum), Shih et al. does not teach or suggest a surface roughness suitable for a structure composed of a non-metal structure such as aluminum oxide, as in the claim. Accordingly, claim 1 and the claims depending therefrom are patentable over Shih et al.

Akiyama et al. does not make up for the deficiencies of Shih et al. Akiyama et al. discloses that "the surface of the high frequency power introducing means or of the ceramic cover may be roughened at least at the side facing the plasma discharge for the purpose mainly of preventing peeling of the deposition film." (column 14, lines 39-43.) Thus, Akiyama et al. discloses roughening a surface of a component for the purpose of improving the adhesion of process deposits. Akiyama et al. does not disclose providing an aluminum oxide structure having a surface with the recited average surface roughness value, and providing a coating of aluminum oxide on the roughened surface. Accordingly, claim 1 and the claims depending therefrom are patentable over Shih et al. in view of Akiyama et al.

Claim 9 similarly recites "a structure composed of aluminum oxide, the structure having a roughened surface with a roughness average of from about 150 to about 450 microinches [and] ... a plasma sprayed ceramic coating deposited on the surface of the structure, the plasma sprayed ceramic coating being composed of aluminum oxide and having a porosity of from about 5% to about 10%," and thus is also

patentable over Shih et al. in view of Akiyama et al. because as discussed above the references do not teach or suggest the recited component having the structure composed of aluminum oxide with the recited average surface roughness, and overlying coating composed of aluminum oxide. Accordingly, claim 9 and the claims depending therefrom are patentable over Shih et al. and Akiyama et al.

The Examiner rejected claim 3 under 35 U.S.C. 103(a) as being unpatentable over Shih et al. in view of Akiyama et al, and further in view of Levinstein et al. This rejection is traversed.

Claim 1, from which claim 3 depends, is patentable over Shih et al, Akiyama et al. and Levinstein et al. because the references do not teach or suggest "a structure composed of aluminum oxide and having a roughened surface with a roughness average across the roughened surface of from about 150 to about 450 microinches [and] ... a plasma sprayed ceramic coating deposited on the roughened surface of the structure, the plasma sprayed ceramic coating composed of aluminum oxide," as recited in the claim. Instead, as discussed above, Shih et al. and Akiyama et al. do not teach or suggest the structure composed of aluminum oxide and having the roughened surface with the recited average surface roughness value and overlying coating composed of aluminum oxide. Levinstein et al does not make up for these deficiencies because Levinstein et al. discloses that "aluminum oxide coatings can be applied to surfaces made, for example, of aluminum, magnesium, titanium, stainless steel, ceramic, plastic or glass," (column 4, lines 43-45) but does not teach or suggest the recited average surface roughness of the roughened surface. Accordingly, claim 1 and the claims depending therefrom are patentable over Shih et al, Akiyama et al and Levinstein et al.

CONCLUSION

The above-discussed amendments are believed to place the present application in condition for allowance. Should the Examiner have any questions regarding the above remarks, the Examiner is requested to telephone Applicant's representative at the number listed below.

Respectfully submitted,
JANAH & ASSOCIATES, P.C.

Date: November 24, 2004

By: _____

Ashok Janah
Reg. No. 37,487

Please direct all telephone calls to: Ashok K. Janah at (415) 538-1555.

Please continue to send correspondence to:

Patent Department, M/S 2061
APPLIED MATERIALS, INC.
P.O. Box 450A
Santa Clara, California 95052.